

Prof. L. G. Carpenter, of the Michigan Agricultural College, Lansing, furnishes the following record of sun spots for July, 1886: 5th, 4 p. m., four groups, twenty-six spots; 10th, faculae; 17th, 3.40 p. m., two groups, eighteen spots; 23d, 3.30 p. m., three groups, twenty-six spots; 28th, 3.30 p. m., four groups, twenty-four spots; 31st, 4.15 p. m., four groups, thirty-six spots.

Prof. David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for July, 1886:

Date— July, 1886. Standard time.	No. of new.		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 6 p. m...	0	0	0	0	0	0	3	50†	
3, 11 a. m...	0	0	0	0	0	0	3	65†	
4, 4 p. m...	0	5†	0	0	0	0	3	45†	
5, 9 a. m...	0	5†	0	0	0	0	3	50†	
22, 2 p. m...							2	25†	
25, 5 p. m...							3	15†	
27, 11 a. m...	2	25†	1	5			4	40†	
28, 9 a. m...	0	0	0	0	0	0	4	45†	
29, 5 p. m...	0	0	0	0	0	0	4	45†	
31, 2 p. m...	0	0	0	0	0	0	4	50†	

Faculae were seen at the time of every observation.

† Approximated.

#### WATER-SPOUTS.

The schooner "Douglas Hovey," Captain Wright, reports seeing three large water-spouts on July 6th, at 6 p. m., when about twenty miles southeast of Cape Hatteras, North Carolina.

Key West, Florida: at 7 p. m. of the 26th a water-spout formed in the bay, about half a mile from the town.

The observer at Pensacola, Florida, reports, as follows, in regard to an unusual phenomenon which occurred at that place on the 13th:

At 3.50 p. m. a revolving column of smoke, between one and two miles distant and moving eastward, was seen to the east of the station. The altitude of the upper end was about 40°; that of the lower end about 20°. The clouds north of the column were moving from the north; those south, from the southwest. The upper end of the column was inclined toward the north at an apparent angle of 30° from the vertical; the phenomenon continued several minutes.

#### VERIFICATIONS.

##### INDICATIONS.

The detailed comparison of the tri-daily indications for July, 1886, with the telegraphic reports for the succeeding thirty-two hours, shows the general average percentage of verifications to be 71.93. The percentages for the different elements are: Weather, 69.35; wind, 65.04; temperature, 76.88. By states, etc., the percentages are: For Maine, 68.35; New Hampshire, 68.89; Vermont, 72.58; Massachusetts, 69.18; Rhode Island, 65.13; Connecticut, 67.92; New York, 73.48; Pennsylvania, 67.29; New Jersey, 69.53; Delaware, 67.29; District of Columbia, 65.50; Maryland, 69.89; Virginia, 70.16; North Carolina, 71.15; South Carolina, 69.89; Georgia, 73.12; Florida, 67.38; Alabama, 71.42; Mississippi, 71.16; Louisiana, 75.63; Texas, 70.79; Arkansas, 70.07; Tennessee, 68.19; Kentucky, 75.18; Ohio, 74.46; West Virginia, 62.19; Indiana, 74.37; Illinois, 74.73; Michigan, 76.08; Wisconsin, 68.82; Minnesota, 67.39; Iowa, 70.68; Kansas, 69.96; Nebraska, 71.15; Missouri, 76.61; Colorado, 69.62; east Dakota, 66.40.

There were twenty-six omissions to predict, out of 9,951, or 0.26 per cent. Of the 9,925 predictions that have been made, seven hundred and ninety-one, or 7.97 per cent., are considered to have entirely failed; six hundred and eighty-five, or 6.90 per cent., were one-fourth verified; 2,274, or 22.91 per cent., were one-half verified; 1,978, or 19.93 per cent., were three-fourths verified; 4,197, or 42.29 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

The following extracts, relative to the method of verifying the forecasts of the Signal Service, from the official instructions governing the Indications Division, Office of the Chief Signal Officer, are published for the information of those interested:

In determining the percentages of verification of predictions, the conditions occurring during the twenty-four hours predicted for, as shown by the charts for the 2d, 3d, and 4th reports, following the report on which the pre-

diction was made, will be carefully examined by the verifying officer, who will ascertain whether the conditions predicted for each state or territory, or part of state or territory, have prevailed in it to the amount of one-fourth, one-half, three-fourths, or the entire area under consideration. The area for which the prediction is made will be considered in verifying weather and temperature; any fraction of area less than one-quarter will be rated one (1); over one-quarter and less than one-half, two (2); over one-half and less than three-quarters, three (3); and over three-quarters, four (4). The barometer indications will not be verified, as the prediction is left optional with the Indications Officer.

In determining the percentage of verification of predictions of wind-direction the verifying officer will note the directions reported on the three charts to which the prediction applies, and will ascertain whether the directions observed fulfill the prediction, as follows: If the direction predicted is observed at one-quarter of the observations reported from the stations on the three charts under consideration the percentage of verifications will be rated one (1); over one-quarter and less than one-half, two (2); over one-half and less than three-quarters, three (3); and over three-quarters, four (4).

In determining the total monthly percentages of verifications for all the predictions, the percentage of verification for each state for weather will be multiplied by five; for temperature, by four; and for wind-direction, by one; the sum of all these will be divided by ten.

#### CAUTIONARY SIGNALS.

During July, 1886, twenty-seven signals of various kinds were ordered, of which number, five, or 18.52 per cent., were fully justified both as to direction and velocity. Of the above signals, eleven were ordered for northeasterly winds; of these, three, or 27.27 per cent., were justified both as to direction and velocity, and three, or 27.27 per cent., were justified as to velocity only. Four signals were ordered for southeasterly winds, of which none were justified both as to direction and velocity, two, or 50.00 per cent., were justified as to velocity only. Eight signals were ordered for southwesterly winds, and two, or 25.00 per cent., were justified both as to direction and velocity. Four signals were ordered for northwesterly winds; of these, none were justified.

In twenty-six cases winds occurred which would have justified cautionary signals had they been displayed, and in twenty-seven cases winds occurred which would have justified the display of on-shore signals.

#### RAILWAY WEATHER SIGNALS.

Prof. P. H. Mell, jr., director of the "Alabama Weather Service," in the report for July, 1886, states:

The verification of predictions for the whole area was 94 per cent. for temperature, and 90 per cent. for weather.

The following corporations comprise this system: South and North; Montgomery and Mobile; Mobile and Girard; Georgia Pacific; East Tennessee, Virginia and Georgia system in Alabama; Memphis and Charleston; Columbus and Western; Atlanta and West Point of Georgia; Northeastern of Georgia; Western and Atlantic; East Tennessee, Virginia and Georgia system in Georgia; Montgomery and Eufaula; Pensacola and Selma; Pensacola and Atlantic; the cities of Milledgeville, Georgia, and Talladega, Alabama.

#### LOCAL WEATHER SIGNALS.

Prof. Goodwin D. Swezey, director of the "Nebraska Weather Service," in the report for July, 1886, makes the percentage of verifications for temperature in the state 88.7, and weather 71.5.

Prof. Winslow Upton, director of the "New England Meteorological Society," in the report for July, 1886, states:

The verification of weather signals at New Haven was 94 per cent. for temperature, 77 for weather; at twelve stations reporting to the secretary, 94.6 for temperature, 79.8 for weather. Local predictions made at Blue Hill in the morning for sixteen hours were 90 per cent. verified, and at sunset for thirty hours were 84 per cent. verified.

J. D. Plunkett, M. D., President of the Tennessee State Board of Health, in the bulletin for July, 1886, gives the following table of verification of weather signals:

Stations.	Temperature.	Weather.	Stations.	Temperature.	Weather.
	Per cent.	Per cent.		Per cent.	Per cent.
Nashville.....	90.3	83.9	Shelbyville.....	54.8	54.8
Jackson.....	89.3	64.5	Fayetteville.....	93.5	74.2
Milan.....	87.1	61.3	Athens.....	100.0	96.8
Trenton.....	100.0	74.2	Springfield.....	96.8	54.8
Clarksville.....	74.2	42.0	Johnson City.....	83.9	67.8
Gallatin.....	100.0	67.7	Lexington.....	93.5	77.4
Murfreesborough.....	90.0	73.3	Loudon.....	96.8	74.2

Average for state, temperature, 89.3; weather, 69.0 per cent.